January 2010

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January 16, 2009

Abstract

We investigate the relationship between a firm's measures of corporate governance, macroeconomic uncertainty and changes in leverage. Recent research highlights the role of governance in financing decisions. Previous research also indicates that macroeconomic uncertainty affects a firm's ability to borrow. In this paper we investigate how both these channels of influence affects firms' financing decisions. Our findings show that macroeconomic uncertainty has an important role to play, both by itself and in interaction with a measure of corporate governance.

*This paper was completed during Boyan Liu's stay as a Visiting Scholar at Boston College, which was financially supported by National Natural Science Foundation of China, No. 70521001, and Research Fund of China Ministry of Education for Ph.D. Development, No. 20050006025. Christopher F Baum gratefully acknowledges financial support from the Fritz Thyssen Foundation. Corresponding author: Christopher F Baum, Department of Economics, Boston College, Chestnut Hill, MA 02467 USA, Tel: 617–552–3673, fax 617–552–2308, e-mail: baum@bc.edu.

Keywords: macroeconomic uncertainty, corporate governance, leverage,
JEL: D81, G32, G34

1 Introduction

There is a large literature, starting with Jensen & Meckling (1976), discussing how agency conflicts affect a firm's capital structure decisions. Evidence from early work generally indicates that entrenched managers prefer lower leverage (Berger, Ofek & Yermack (1997), Garvey & Hanka (1999)). In recent years, widely available use of indices to measure shareholder rights (for example, the Gindex of Gompers, Ishii & Metrick (2003)) has produced new results that do not agree with these empirical findings.

Jiraporn & Gleason (2007) argue that since leverage alleviates agency problems, firms with larger agency problems should adopt higher debt ratios. They find that debt ratios are inversely related to measures for better corporate governance for a large sample of non-regulated firms between 1993-2002. John & Litov (2008) also find, over a similar period, that manufacturing firms with weaker shareholder rights use more debt financing and have higher leverage between 1993-2004.[1] They assume that better-governed firms are easier to monitor: it is easier for the market to distinguish between managers' bad luck versus bad judgment. This allows better-governed firms to take more risks. In equilibrium, a tradeoff between expected bankruptcy costs and debt-related benefits (such as tax shields) implies that firms with riskier investments will choose lower levels of debt. Following that logic, John and Litov find that poorly governed firms will be associated with more conservative investments and higher use of debt relative to their better-governed counterparts.[2]

The focus of this paper is to highlight the impact of macroeconomic uncertainty on the relationship between corporate governance and changes in firms' financial leverage. It is reasonable to assume that economy-wide risks that are exogenous

[1] Wald & Long (2007) also find a firms that incorporate themselves with states with stronger anti-takeover provisions (i.e., weaker shareholder rights) have a higher debt-to-market ratio. They attribute this to the decrease in firm value associated with anti-takeover amendments.

[2] A theoretical framework for why entrenched managers may prefer safer investments is developed in John, Litov & Yeung (2008).

to the operation of the firm and difficult to hedge against may play an important role in any financing decision. There is strong evidence that firms time their debt issuance based on macroeconomic conditions (Korajczyk & Levy (2003)). However, prior research has not considered how the governance-leverage relationship may be affected by macroeconomic risks. This is the primary contribution of our paper.

We first investigate if corporate governance affects firms' financing decisions. Our results are consistent with the more recent findings that firms make more use of debt as corporate governance weakens. The introduction of macroeconomic uncertainty does not change this result in qualitative terms. However, we find an interesting new result on the interaction of uncertainty with a measure of governance in explaining the use of debt finance. Our results indicate that in response to increased uncertainty, a firm with stronger governance tends to increase debt financing by a larger amount relative to a firm with weaker governance. This is consistent with the observation that in more uncertain times the weakly-governed firms may be more credit constrained that their better-governed counterparts.

These findings complement previous work in several ways. We show that both macroeconomic uncertainty faced by the firm and its governance structure influence how a firm chooses leverage. More interestingly, our results indicate that the effects of these factors are interactive in nature: macroeconomic uncertainty alters the impact of how governance affects debt financing, and *vice versa*. Excluding such interactions from the model is likely to bias any estimate of the impact of corporate governance on firms' choice of leverage.

To address these issues, we first review both strands of the relevant literature. In Section 3, we discuss the identification of a proxy for macroeconomic uncertainty, present our empirical model of a nonfinancial firm's leverage behavior and details of the data employed in estimation. Our empirical findings are presented in Section 4 and Section 5 offers concluding remarks.

2 Leverage, macroeconomic uncertainty, and corporate governance

Many researchers have considered the importance of firm-specific characteristics as a determinant of firms' choice of financial leverage (Titman & Wessels (1988), Havakimian, Opler & Titman (2001)). Recently, increasing scrutiny has been focused on agency cost related explanations for firms' capital structure decisions. These studies have generally used different measures of shareholders' rights to proxy for the quality of corporate governance. In sharp contrast to prior work, some studies report that various governance indicators play an important role in managers' financing decisions.

There is an equally large literature that documents how capital structure choice varies over time. Some of these studies make a strong case that the macroeconomic environment within which firms operate could be an equally important determinant of their financing decision (Choe, Masulis & Nanda (1993), Gertler & Gilchrist (1994)). Bernanke & Gertler (1995) also provide a very extensive discussion of the impact of monetary policy on the cost of borrowing.

The purpose of this paper is not to test the adequacy of any of these models that try to explain a firm's capital structure. We review this literature in order to provide a rationale for studying the impact of macroeconomic uncertainty on the leverage-governance relationship. In this section of the paper, we discuss relevant aspects of these two strands of literature and motivate our study in which they both are intertwined.

2.1 The effects of corporate governance on leverage

Agency costs are not observable, but it may be possible to evaluate the quality of corporate governance in a hedonic sense by considering a number of firm characteristics. This is the approach taken by Gompers et al. (2003) in forming their *Gindex* measure

of the quality of governance. The *Gindex* is a broad index of antitakeover provisions that influence the likelihood that managers will be able to insulate themselves from the risk of takeover. The 24 provisions, categorized in five groups (delay, protection, voting, state and other provisions) are noted by their presence or absence. The *Gindex* is then measured on a scale of 0 to 24, with higher values indicating greater power in the hands of managers and higher agency costs.

There is a wide body of literature that documents the impact of these indices on various corporate decisions. For example, Gompers et al. (2003) and Core, Guay & Rusticus (2006) document that firms with a large number of antitakeover provisions have lower operating performance compared to those with a small number of provisions. In a similar spirit Masulis, Wang & Xie (2007) find that the *GIndex* is related to stockholder reaction to merger announcements, with high *GIndex* firms suffering larger losses on the announcement of a takeover attempt. These results indicate *Gindex* can be considered a reasonable measure of the quality of corporate governance, with low values signifying strong shareholders? rights and high values indicative of agency costs.

A good measure of agency costs is important to any empirical work on capital structure as theory suggests the conflicts of interest between firms' stakeholders may play an important role in any financing decision. While earlier work indicates that entrenched managers may seek to avoid debt, evidence also exists that entrenched managers may use higher leverage to thwart expected takeovers (Zwiebel (1996)). Recently the use of governance indices to measure agency costs Jiraporn & Gleason (2007), Wald & Long (2007) and John & Litov (2008)) has furthered interest on the relation between entrenchment and leverage. While findings differ among these studies, all of them report an inverse association between measures of better governance and leverage.

Our main contribution is to incorporate in this line of reasoning another important determinant of leverage: macroeconomic uncertainty. We highlight the impact

of macroeconomic uncertainty on the governance-leverage relationship. There are hints in other research that this interaction might be significant. For example, John & Litov (2008) find that firms with weaker governance enjoy lower bond yields when issuing debt and earn higher credit ratings, allowing these firms to issue more debt. Macroeconomic uncertainty should play an important role in firms' ability to access the capital market. We develop this intuition in the next section.

2.2 The effects of macroeconomic uncertainty on leverage

Macroeconomic uncertainty affects both the level of firms' capital investment and how it is financed. Leahy & Whited (1996) provide a good review of the former, reporting that uncertainty reduces investment in their sample but noting that the theoretical prediction on this question is ambiguous and empirical evidence on this issue remains inconclusive. Korajczyk & Levy (2003) point out an important factor that might explain often-contradictory results on this issue. They find that that financially constrained firms react differently to uncertainty than unconstrained firms. As exogenous proxies for financial constraints are difficult to construct, how macroeconomic uncertainty may affect the financing decision largely remains an empirical issue.

Prior work also provides equally good reasons for why the observed relation between debt financing and governance should be positively or negatively affected by increases in macroeconomic uncertainty. In our context, added uncertainty should exacerbate the monitoring problem: i.e., with greater uncertainty it should be harder to distinguish between managers' bad luck and bad performance. More strongly governed firms, with better alignment between shareholders' and managers' interests, should choose more risky projects and use less debt to finance them. Weakly governed firms should choose less risky projects and and make greater use of debt finance given the lower expected risk of bankruptcy. However, macroeconomic uncertainty also affects a firm's ability to borrow, and weakly governed firms with high leverage

will be more likely to be credit constrained (Bernanke & Gertler (1995)).

Once one considers both the incentive to borrow and the ability to borrow, the question of how financing decisions are affected by heightened macroeconomic risk becomes largely an empirical issue. However, we expect the ability to borrow to play a large role in our model. There is overwhelming evidence that highly leveraged firms are more likely to be credit constrained in times of higher uncertainty. We observe weakly governed firms are more highly levered. Economic intuition dictates that in more uncertain times firms these firms will tend to increase debt financing by a smaller amount relative to firms with stronger governance.

3 Modelling firms' choice of leverage

A challenge to any study considering the effects of uncertainty on firms' behavior is the construction of an appropriate proxy for uncertainty. The next subsection describes our strategy in generating a proxy for macroeconomic uncertainty.

3.1 Identifying macroeconomic uncertainty

In our investigation, as in Driver, Temple & Urga (2005) and Byrne & Davis (2002), we use a GARCH model to proxy for macroeconomic uncertainty. We believe that this approach is more appropriate compared to alternatives such as proxies obtained from moving standard deviations of the macroeconomic series (e.g., Ghosal & Loungani (2000)) or survey-based measures based on the dispersion of forecasts (e.g., Graham & Harvey (2001), Schmukler, Mehrez & Kaufmann (1999)).

We define a volatility measure $\phi_{i,t}$ derived from changes in the index of leading indicators (LI) as a proxy for the macro-level uncertainty that firms face in their financial and production decisions. We build a generalized ARCH (GARCH(1,2)) model for ΔLI where the mean equation is an autoregression over 1979m3–2006m12, as reported in Table 1. The conditional variance derived from this GARCH model is

averaged to the annual frequency and then employed in the analysis as our measure of macroeconomic uncertainty.

3.2 Econometric specification

We test the hypotheses that both corporate governance and macroeconomic uncertainty have important effects on nonfinancial firms' variations in leverage by extending the econometric model of Baum, Stephan & Talavera (2008). That paper focused on the level of short-term leverage, rather than the measure that we consider in this work. In our specification, we explain a measure of the net change in leverage, following Berger et al. (1997), defined as

$$\Delta L_{i,t} = \frac{\Delta D_{i,t} - \Delta Ei, t}{A_{i,t}} \tag{1}$$

where $D_{i,t}$ is book debt, $E_{i,t}$ is book equity and $A_{i,t}$ is total assets at the end of the current fiscal year.

The resulting empirical specification, employing a dynamic panel data model, is:

$$\begin{aligned} \Delta L_{i,t} &= \beta_0 + \beta_1 \Delta L_{i,t-1} + \beta_2 C_{it} + \beta_3 S_{it} + \beta_4 I_{it+1} + \beta_5 I_{it} + \beta_6 Gindex_{i,t} + \\ & \beta_7 LI_{t-1} + + \beta_8 \phi_{t-1} + \beta_9 Gindex_{i,t} \times \phi_{i,t-1} + f_i + \tau_t + e_{it} \end{aligned} \tag{2}$$

$C_{i,t}$, cash holdings, $S_{i,t}$, net sales and $I_{i,t}$ is capital investment, each scaled by total assets, are entered as firm-level controls. $Gindex_{i,t}$ is the firm's index of corporate governance. LI_{t-1} is the lagged level of the index of leading indicators, a forward-looking measure of macroeconomic conditions, while ϕ_{t-1} is its conditional variance. As COMPUSTAT gives end-of-period values for firms, we include lagged values of the proxies for macroeconomic conditions and macroeconomic uncertainty in the regressions rather than contemporaneous proxies, so that recently-experienced volatility will affect firms' behavior. To address unobserved heterogeneity, we include firm fixed effects (f_i) and time fixed effects (τ_t) in the specification.

The main hypothesis of our paper can be stated as:

$$H_0 : \beta_8 \neq 0 \tag{3}$$

$$H_0 : \beta_9 \neq 0 \tag{4}$$

That is, macroeconomic uncertainty will have an important effect on the firms' net change in leverage, by itself and in conjunction with the measure of corporate governance, *Gindex*.

3.3 Data

For the empirical investigation we work with Standard & Poor's Annual Industrial COMPUSTAT database of U.S. firms. The initial database includes 788,304 firm-year characteristics over 1990–2006. We restrict our analysis to manufacturing firms (firms classified with one-digit Standard Industrial Classification codes 2 or 3) for which COMPUSTAT provides information. The firms are classified by two-digit Standard Industrial Classification (SIC).

In order to construct firm-specific variables we utilize COMPUSTAT data items Cash and Short-term Investment ($data1$), Depreciation ($data5$), Total Assets ($data6$), Income before Extraordinary Items ($data18$), Capital Expenditures ($data128$ item), Sales ($data12$ item) and Operating Income before Depreciation ($data13$ item).

In order to measure the quality of corporate governance, we use the IRRC database which provides annual data on anti-takeover provisions for the years 1990, 1993, 1995, 1998, 2000, 2002, and 2004 on anti-takeover provisions. Following Gompers et al. (2003), we use data from IRRC, filling in the missing years, to construct an annual governance index (*Gindex*) and an entrenchment index (*Eindex*) (Bebchuk, Cohen & Ferrell (2004)) as measures of the quality of corporate governance.

After merging the COMPUSTAT and IRRC samples and dropping firm-years with missing data, we obtain about 1,125 firms' annual characteristics. Descriptive statistics for the variables entering the model are presented in Table 1.

4 Empirical findings

Estimates of optimal corporate behavior often suffer from endogeneity problems, and the use of instrumental variables may be considered as a possible solution. We estimate our econometric models using the system dynamic panel data (DPD) estimator. System DPD combines equations in differences of the variables with equations in levels of the variables. In this "system GMM" approach (see Blundell & Bond (1998)), lagged levels are used as instruments for differenced equations and lagged differences are used as instruments for level equations. The models are estimated using a first difference transformation to remove the individual firm effect.

The reliability of our econometric methodology depends crucially on the validity of instruments. We check it with Hansen's J test of overidentifying restrictions, which is asymptotically distributed as χ^2 in the number of restrictions. The consistency of estimates also depends on the serial correlation in the error terms. We present test statistics for first-order and second-order serial correlation in the results tables. The errors of a properly specified model will not exhibit $AR(2)$.

Table 3 presents our estimates of three forms of the model of firms' leverage ratios. In the first column, we present a model that includes only firm controls and the level of macroeconomic activity (ΔLI_{t-1}), which enters with a positive and significant coefficient. In column 2, we augment this model with the proxy for macroeconomic uncertainty (ψ_t), which also entered with a positive and significant coefficient. These results imply that both changes in the macroeconomic environment and changes in its volatility are associated with greater changes in firms' leverage.

In column 3, we consider the effects of corporate governance, $Gindex$. That variable takes on a significant positive coefficient, implying that firms' managers who have more control over the firm tend to make larger changes in firm leverage. In the last column, we test whether there are significant interaction effects between macroeconomic uncertainty and corporate governance. The interaction term has a

negative and significant coefficient.

A key element of our analysis is the consideration of possible interaction effects between uncertainty and the measure of corporate governance. In the presence of statistically significant interactions, the effect of uncertainty (governance) is moderated by the level of governance (uncertainty), and a model excluding those significant interactions will yield biased and inconsistent estimates of the effect of either factor. Thus, we present summary estimates of the effects of each type of uncertainty and the governance index in Table 4. The summary estimates (or total derivatives) compute

$$\frac{\partial(\Delta L)}{\partial \psi} = \hat{\beta}_{\psi} + \hat{\beta}_{\psi Gindex} \times Gindex^{*} \tag{5}$$

and

$$\frac{\partial(\Delta L)}{\partial Gindex} = \hat{\beta}_{Gindex} + \hat{\beta}_{\psi Gindex} \times \psi^{*} \tag{6}$$

in point and interval form, where $\hat{\beta}_{\psi}, \hat{\beta}_{Gindex}$ and $\hat{\beta}_{\psi Gindex}$ refer to the estimated coefficients for the effects of macroeconomic uncertainty, corporate governance and their interactions, respectively. ψ^{*} and $Gindex^{*}$ refer to particular levels of the uncertainty and governance measures. In Table 4, those levels are chosen as the 10^{th}, 25^{th}, 50^{th} (median), 75^{th} and 90^{th} percentiles of each measure. Figure 1 displays point and interval estimates of the elasticities of ΔL with respect to macroeconomic uncertainty, evaluated at each sample value of *Gindex*.

In summary, these results show that while the quality of corporate governance (as proxied by the single factor *Gindex*) has a distinguishable effect on firms' variations in leverage, that effect cannot be calculated in isolation, ignoring the degrees of macroeconomic uncertainty faced by the firm. The effects of governance depend quite markedly on variations in macroeconomic uncertainty, and the effects of macroeconomic uncertainty notably depend on the governance index. Neither factor should be considered in the absence of the other.

5 Conclusions

This study considers the importance of the nonfinancial firm's uncertain macroeconomic environment as well as its quality of governance in determining its managers' choice of financial leverage. The existing literature considers the importance of each of these factors, but few studies have considered them in combination. In this research we have demonstrated the importance of considering both factors in terms of the conflicting motives of shareholders' and managers' interests.

Our findings, drawn from a sizable panel dataset of U.S. nonfinancial firms, support the hypothesis that variations in firms' financial leverage ratios differ meaningfully among firms with differing levels of corporate governance or agency costs, while reacting to variations in macroeconomic uncertainty facing the firm. When these factors are both included in the model, each has an important role to play. The importance of both factors in determining firms' choice of leverage is evident.

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Table 1: Descriptive Statistics, 1990–2006

$\Delta L_{i,t}$ is the net change in leverage, $\Delta L_{i,t}$. C is cash holdings, S is net sales and I is capital investment, all scaled by total assets. LI is the index of leading indicators, while ψ is its conditional variance. *Gindex* is the corporate governance index.

	mean	sd	p25	p50	p75	N
$\Delta L_{i,t}$	0.0132	0.1218	-0.0240	0.0009	0.0484	7,497
Cash/Total Assets	0.1152	0.1482	0.0181	0.0552	0.1524	7,497
Sales/Total Assets	1.1009	0.5668	0.7435	1.0217	1.3522	7,497
Investment/Total Assets	0.0572	0.0463	0.0281	0.0455	0.0719	7,497
LI	108.2142	16.0181	95.3083	108.9417	118.4000	7,497
ψ_t	2.4226	0.3039	2.1241	2.3960	2.6395	7,497
Gindex	9.3519	2.7766	7.0000	9.0000	11.0000	7,497

Notes: $p25$, $p50$ and $p75$ are the quartiles of the variable, while N is the number of firm-years available for the estimation sample.

Table 2: GARCH(1,2) Proxy for Macroeconomic Uncertainty

dlead is the index of leading indicators. The GARCH(1,2) model is fit to the change in the index, allowing for $MA(1)$ errors in the mean equation.

	(1)
	$\Delta dlead$
$\Delta dlead_{t-1}$	0.887***
	(15.876)
Constant	0.027*
	(1.847)
$MA(1)$	-0.725***
	(-8.255)
$ARCH(1)$	0.076*
	(1.916)
$GARCH(1)$	0.050
	(0.414)
$GARCH(2)$	0.796***
	(5.480)
Constant	0.019
	(1.066)
log-likelihood	-240.198
Observations	334

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Models of Change in Leverage vs. *Gindex* and Uncertainty

The dependent variable is the net change in leverage, $\Delta L_{i,t}$. C is cash holdings, S is net sales and I is capital investment, all scaled by total assets. LI is the index of leading indicators, while ψ is its conditional variance of ΔLI. *Gindex* is the corporate governance index.

Variable	[1]	[2]	[3]	[4]
$\Delta L_{i,t-1}$	0.0497	-0.0908	-0.1280	-0.0968
	(0.5966)	(-0.9860)	(-1.3987)	(-1.2136)
C_t	-0.0770	0.0117	0.1467**	0.0349
	(-1.6425)	(0.2331)	(2.0642)	(0.6173)
S_t	-0.0020	0.0264*	0.0256	0.0264*
	(-0.1352)	(1.7169)	(1.6319)	(1.7527)
I_{t+1}	-0.7575**	-0.8738***	-0.8228***	-0.7795***
	(-2.1548)	(-2.8995)	(-2.9161)	(-2.7559)
I_t	0.6949**	0.6680**	0.7419***	0.5970**
	(2.2167)	(2.3141)	(2.6589)	(2.1794)
LI_{t-1}	0.0030***	0.0046***	0.0034***	0.0046***
	(3.8064)	(3.8380)	(4.3263)	(3.8546)
ψ_{t-1}		0.1093**		0.1471***
		(2.5609)		(3.0398)
$Gindex_t$			0.0111***	0.0103**
			(3.0462)	(2.0532)
$\psi_{t-1} \times Gindex_t$				-0.0040*
				(-1.8330)
Constant	-0.3501***	-0.8900***	-0.5725***	-0.9957***
	(-3.5590)	(-3.3878)	(-4.9975)	(-3.7118)
N	7497	7497	7497	7497
Hansen P-val	0.5181	0.3171	0.5674	0.4063
AR(1) P-val	0.0000	0.0000	0.0001	0.0000
AR(2) P-val	0.9093	0.2281	0.1202	0.1421

Notes: System GMM estimates with robust standard errors. t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The Hansen P-val relates to the test of overidentifying restrictions, while $AR(1), AR(2)$ are the Arellano–Bond tests of first- and second-order autocorrelation of the errors, respectively.

Table 4: Sensitivities for Macroeconomic Uncertainty Measure and *Gindex*

	$p10$	$p25$	$p50$	$p75$	$p90$
			(A)		
Percentiles of Gindex	5.00000	7.00000	9.00000	11.00000	13.00000
$\partial Var(\Delta LI)$	0.12724	0.11929	0.11134	0.10340	0.09545
Std.err.	0.04421	0.04319	0.04259	0.04242	0.04270
p-value	0.00204	0.00292	0.00453	0.00748	0.01280
			(B)		
Percentiles of $Var(\Delta LI)$	2.07239	2.16638	2.50529	2.74508	3.01049
$\partial Gindex_{Var(\Delta LI)}$	0.00209	0.00172	0.00037	-0.00058	-0.00164
Std.err.	0.00106	0.00099	0.00108	0.00140	0.00186
p.value	0.02447	0.04196	0.36593	0.33888	0.18950

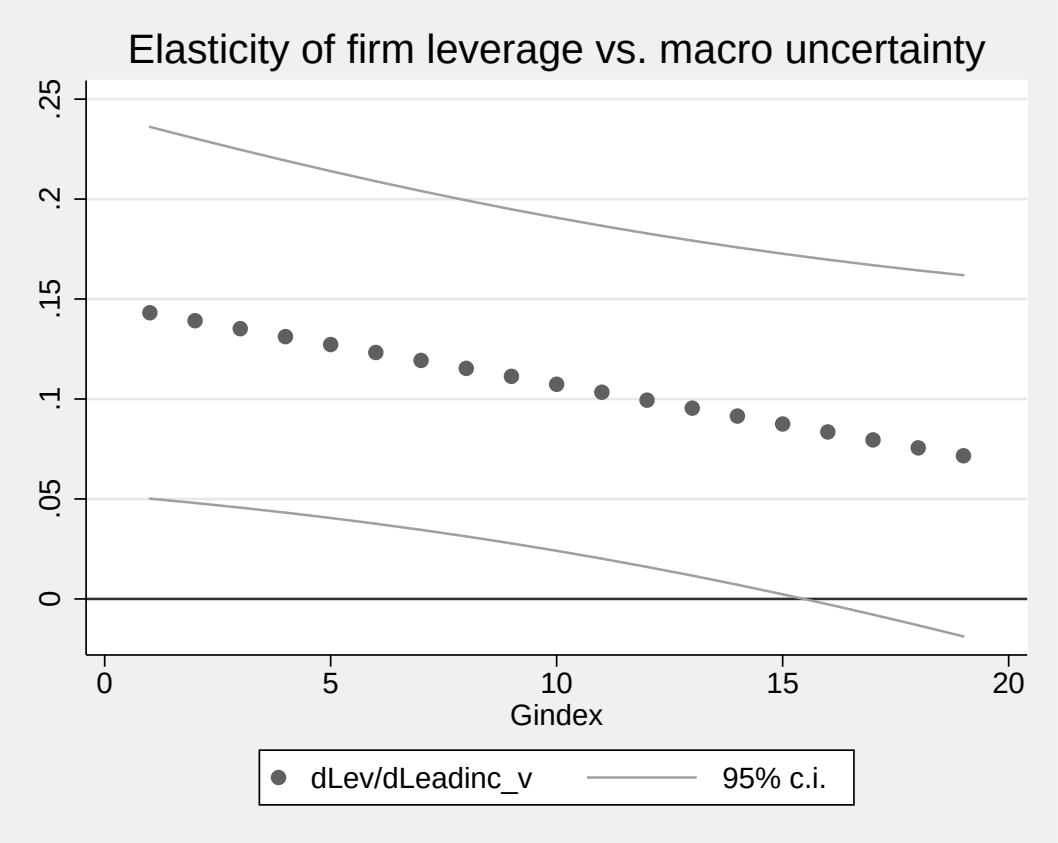

Figure 1: **Sensitivity of Δ Leverage/Uncertainty interaction to Gindex**